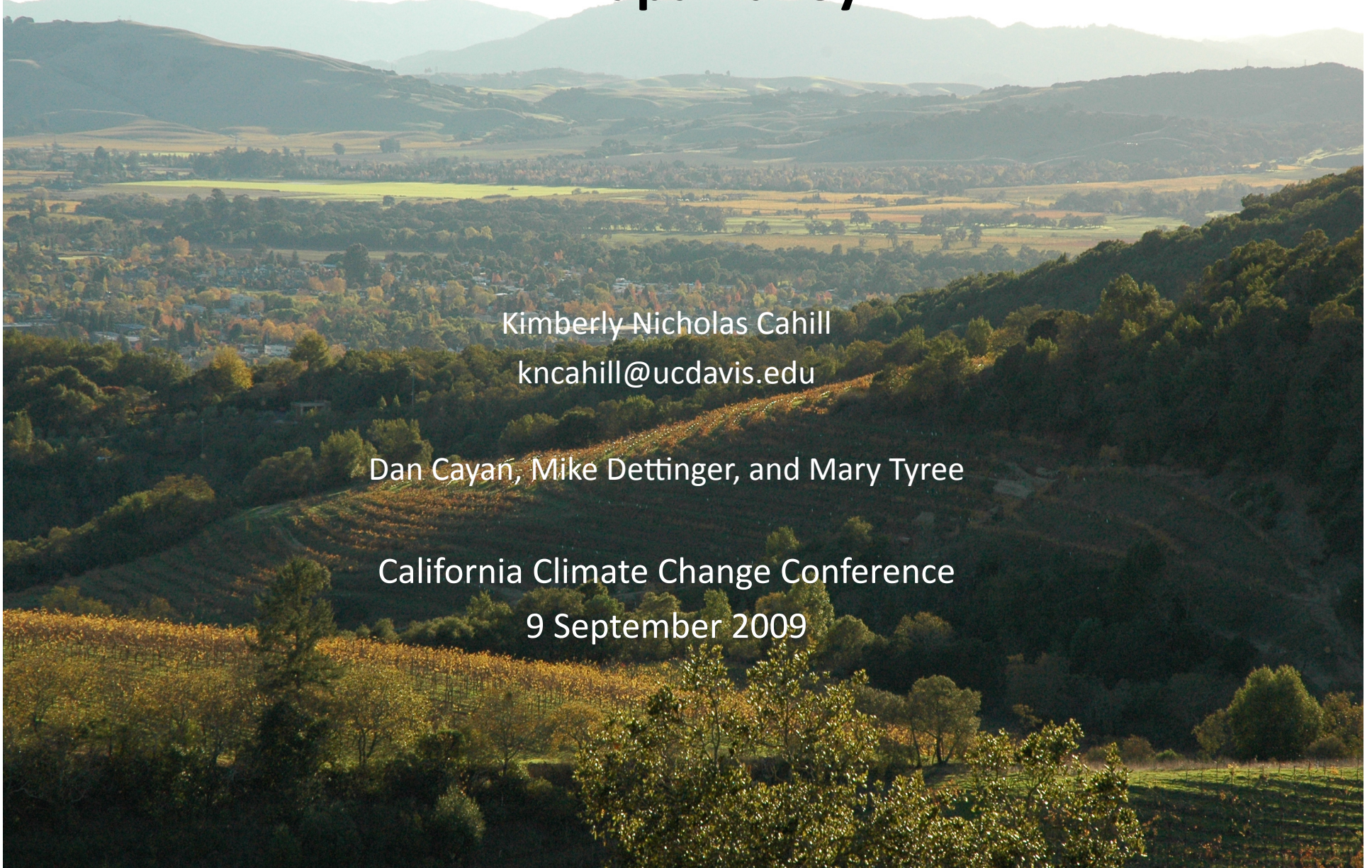


Climate and Winegrape Phenology in Napa Valley

Kimberly Nicholas Cahill
kncahill@ucdavis.edu

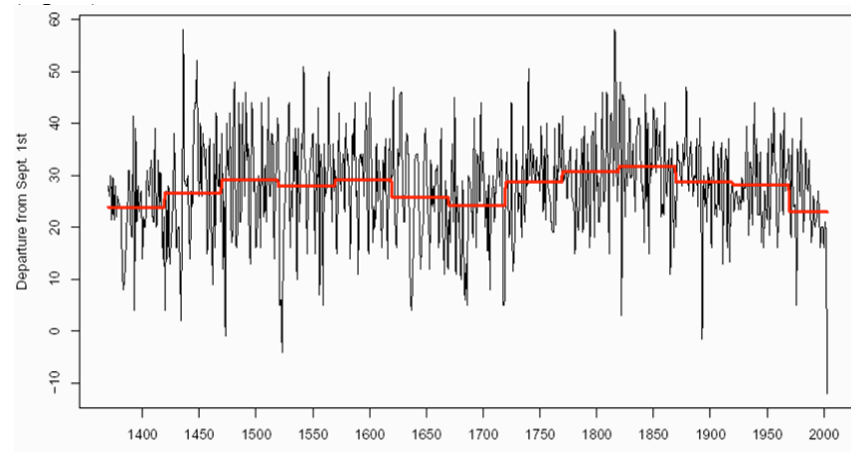
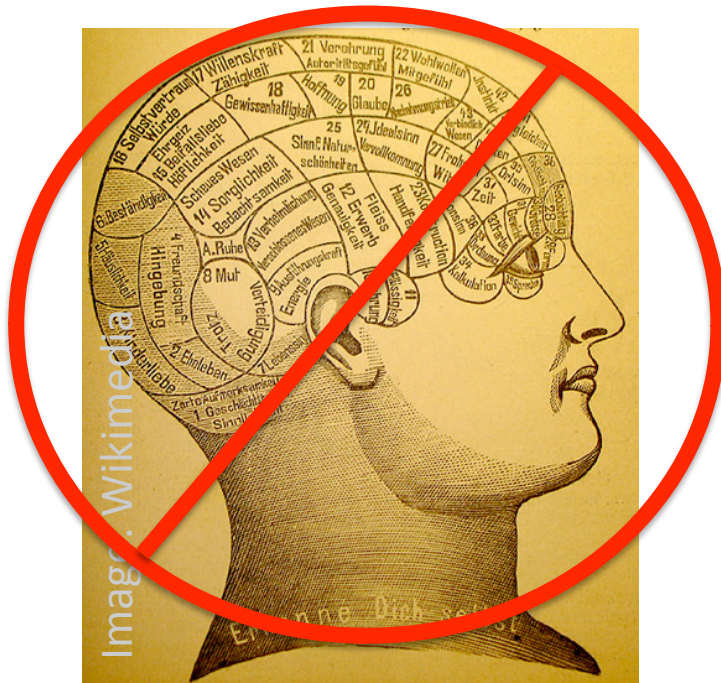
Dan Cayan, Mike Dettinger, and Mary Tyree

California Climate Change Conference
9 September 2009



Phenology & Climate

- Grapevines as sensitive climate indicators



Chuine et al. (Nature, 2004) used grape harvest dates to reconstruct climate back to 1370!

PhRenology



Dormancy



Budburst



Bloom



Véraison



Harvest

Winegrowing in California

Raisins



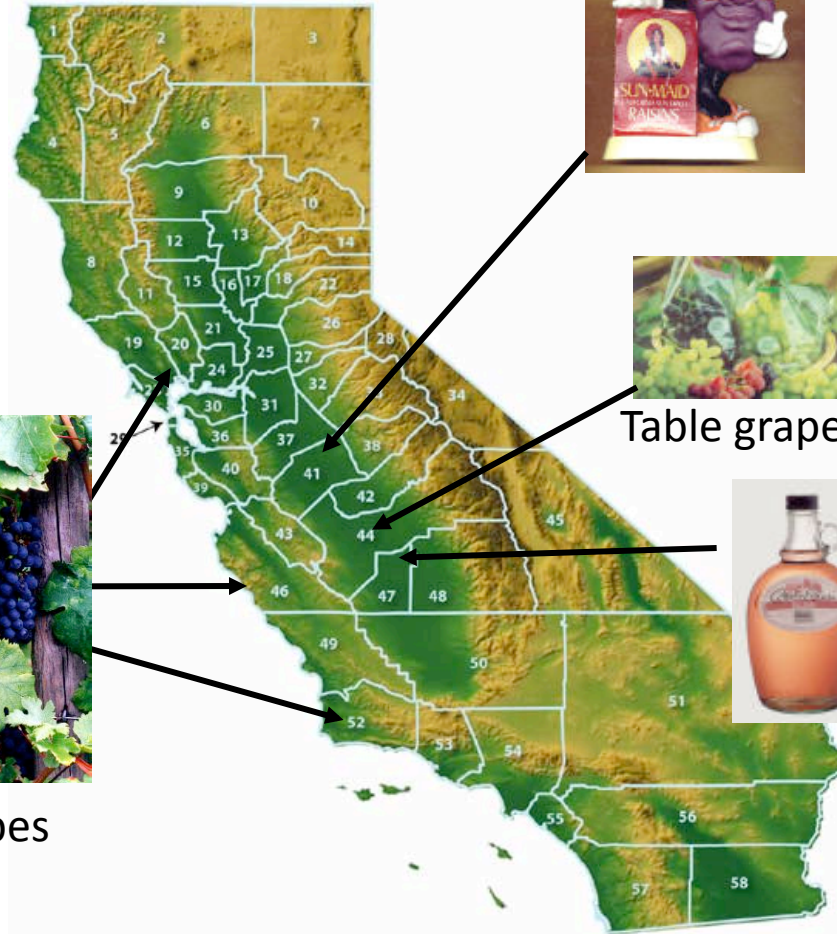
Table grapes



Bulk wine



Wine grapes

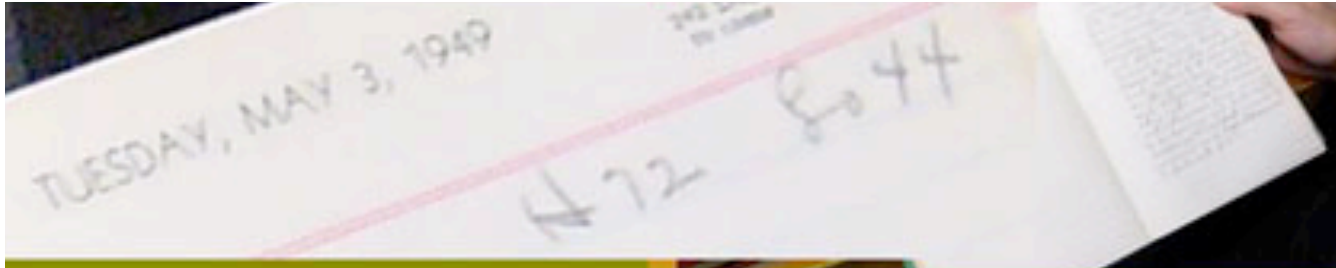


Project Overview

- Use-inspired research, undertaken in collaboration with Napa Valley Vintners
- Growers and winemakers interested in understanding the historical climate of their Valley, and its effect on winegrowing
- Develop baseline understanding before future projections have stakeholder credibility



Harmonizing Disparate Records



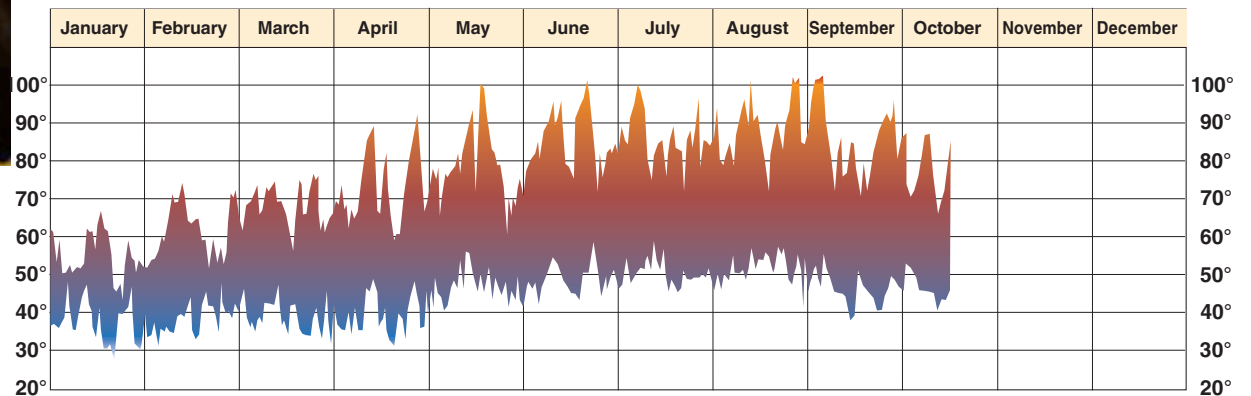
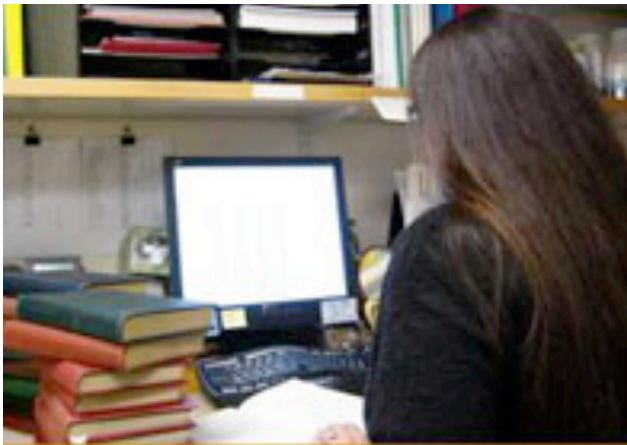
Kinds of data solicited:

Climate

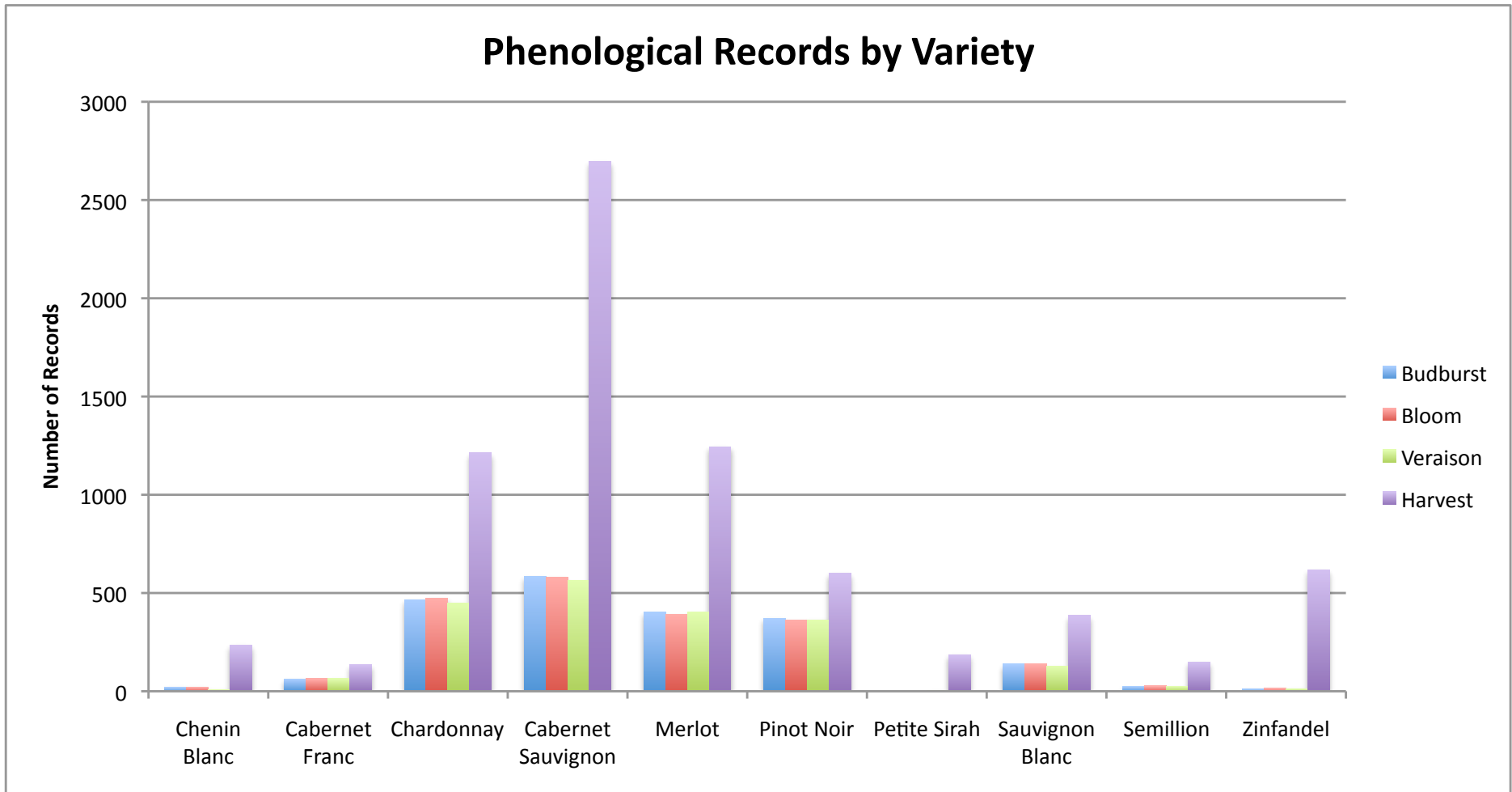
Phenology

Grape composition

Yields

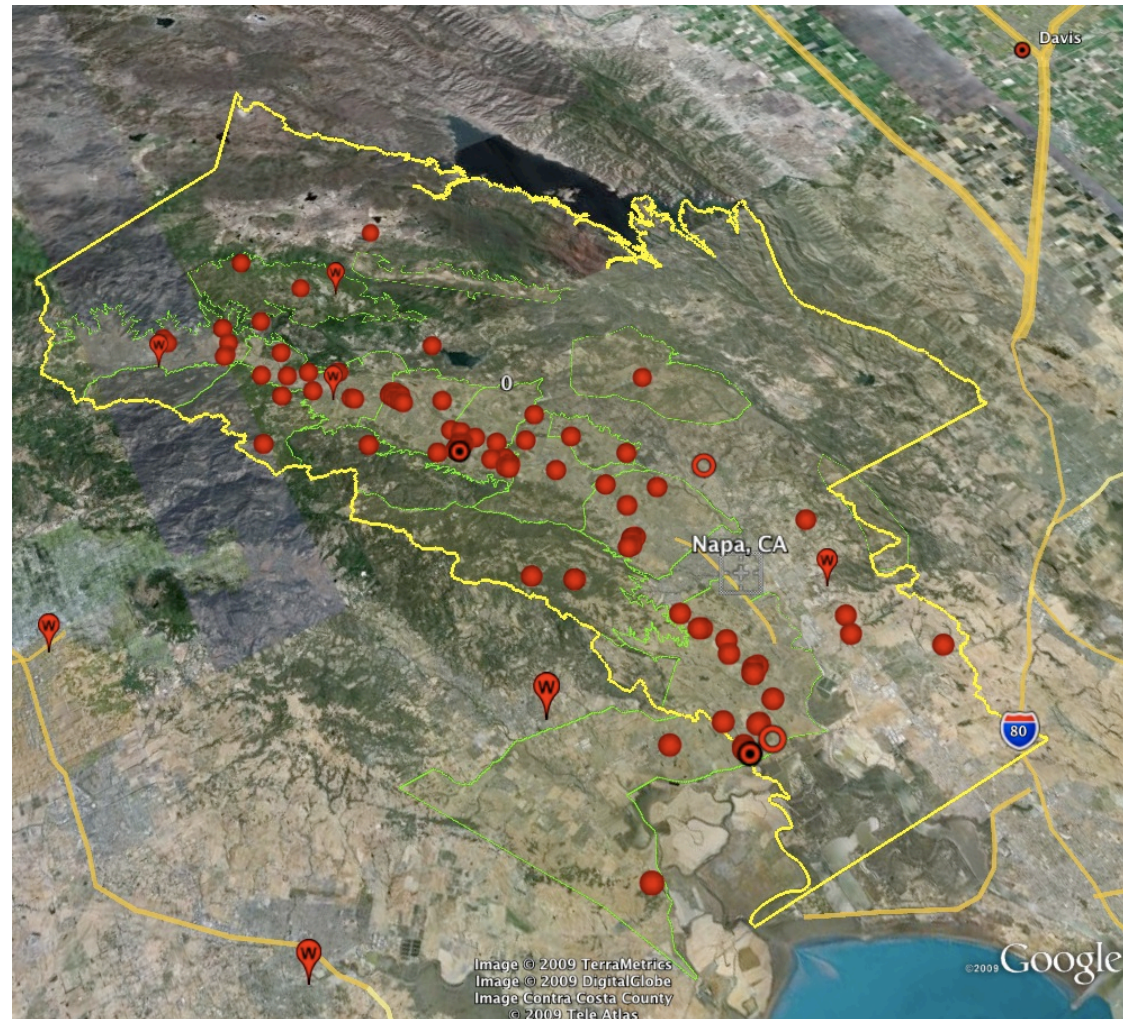


Data Contributions

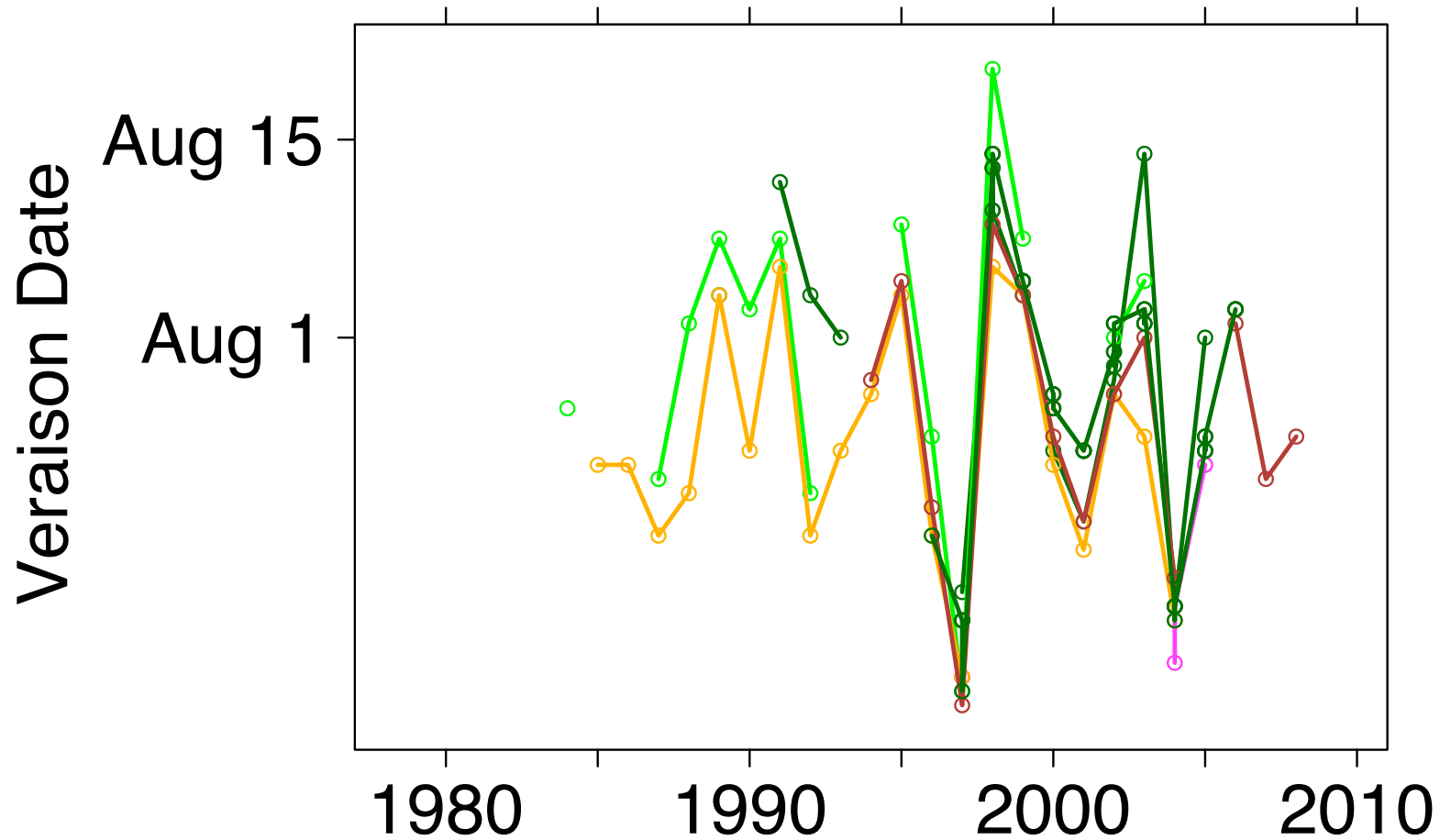


- Nearly 10,000 phenological records contributed by private growers & winemakers
- 68 winegrape varieties (top 10 varieties = 85% of records)
- A few early records back to the 1940's; most start in late 1970's

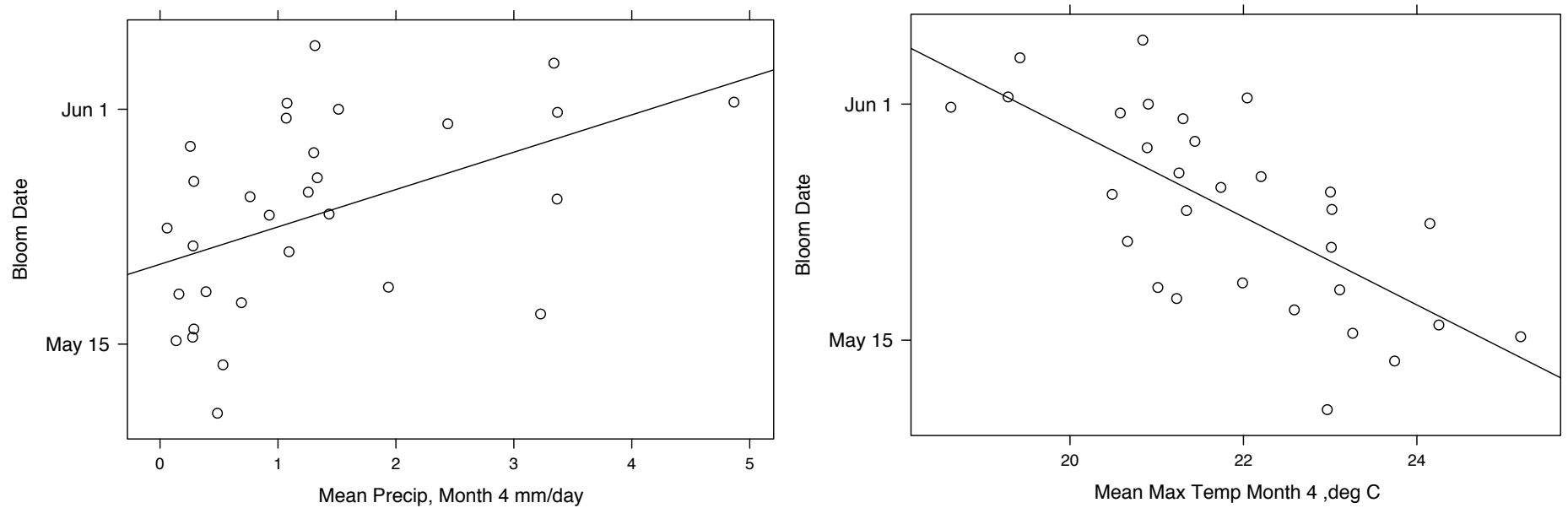
Data Coverage



Véraison by Vineyard, Sauv Blanc

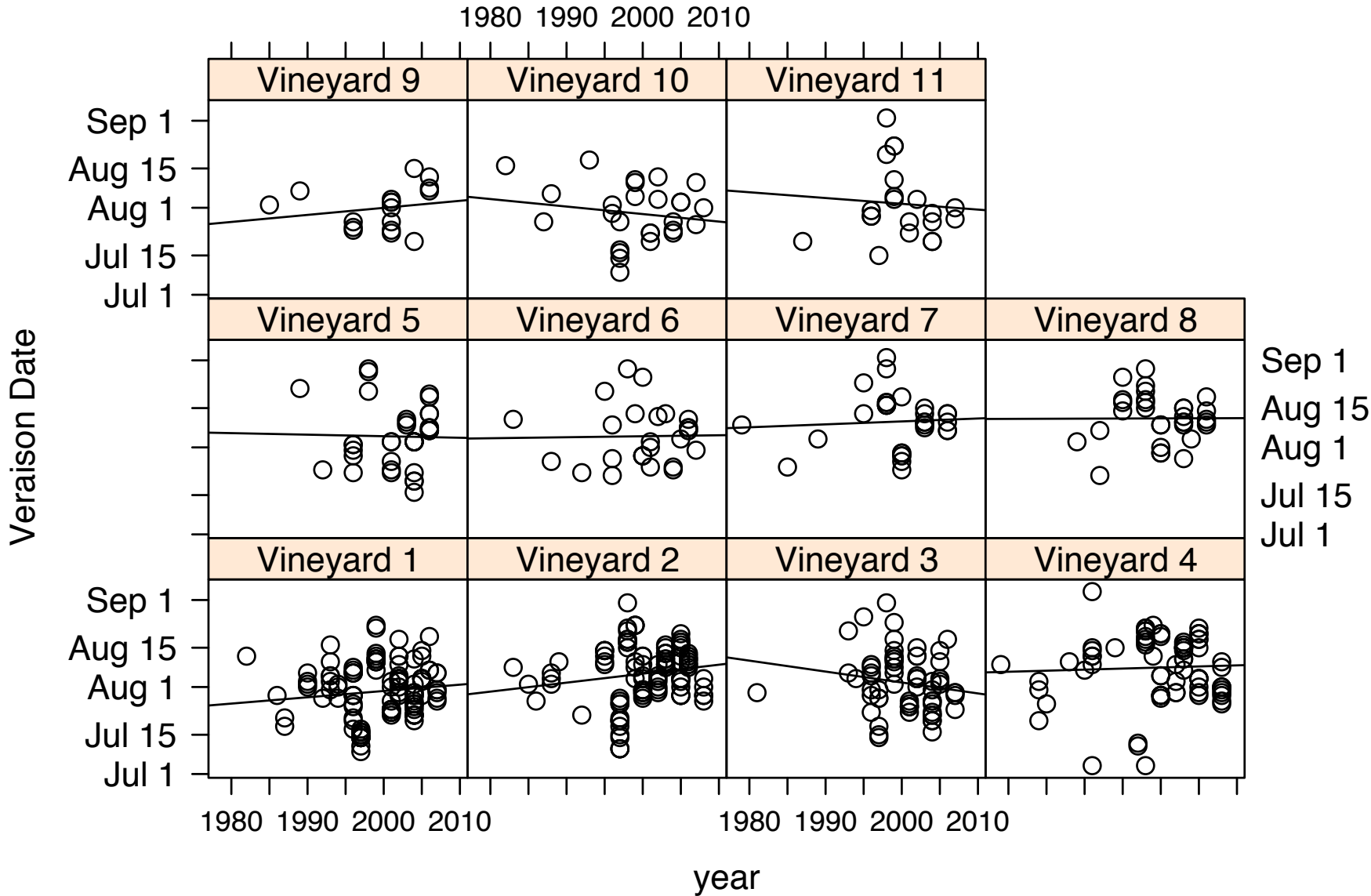


Climate Drivers of Cabernet Bloom

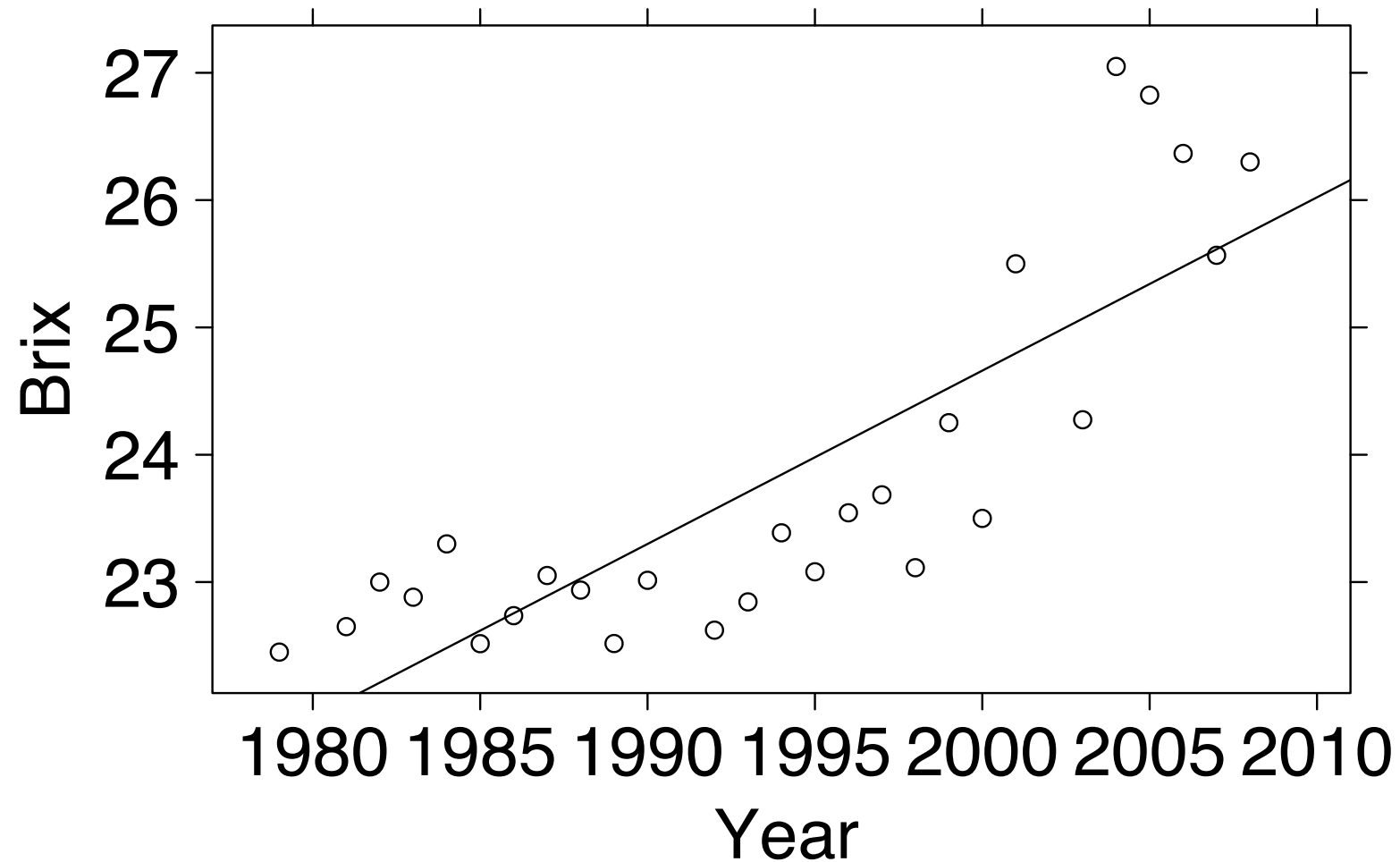


Averaged across all Cabernet vineyards per year

Trends in Cabernet Vraison Date over Time by Vineyard

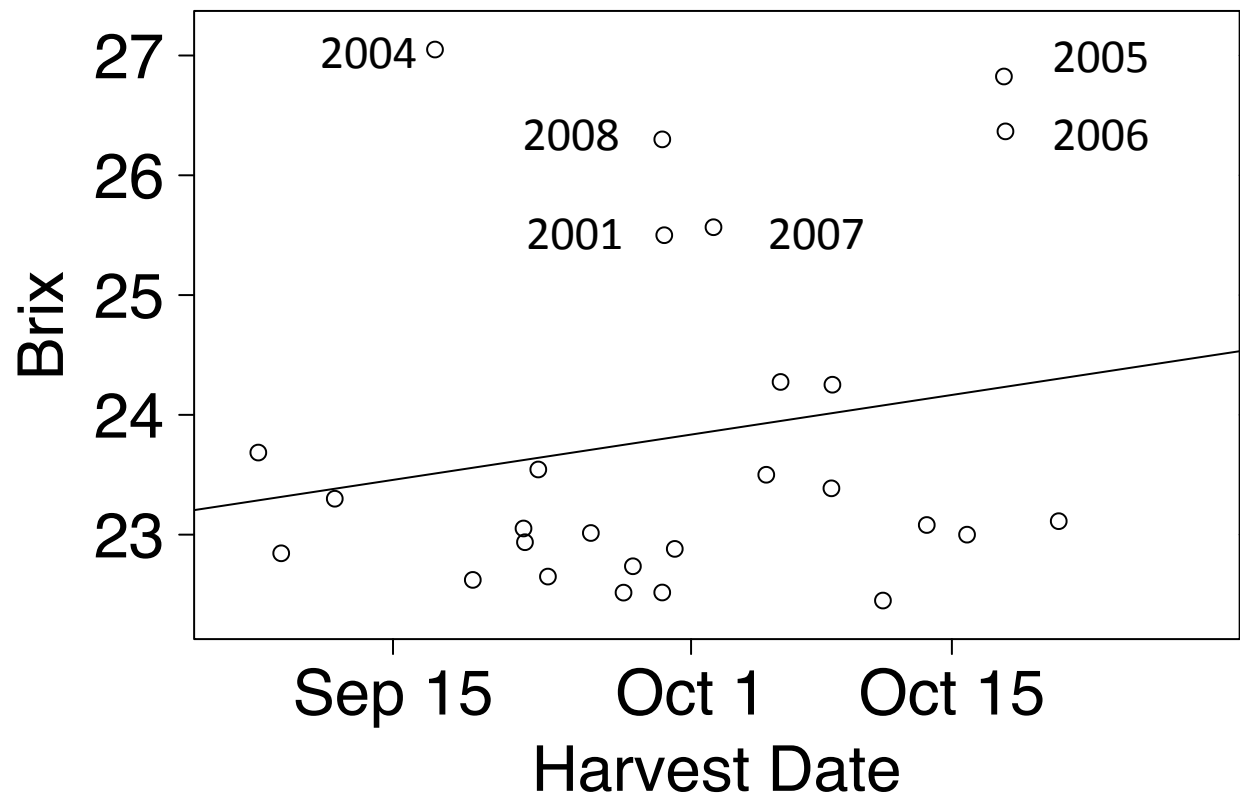


Increase in Cabernet Sugar at Harvest

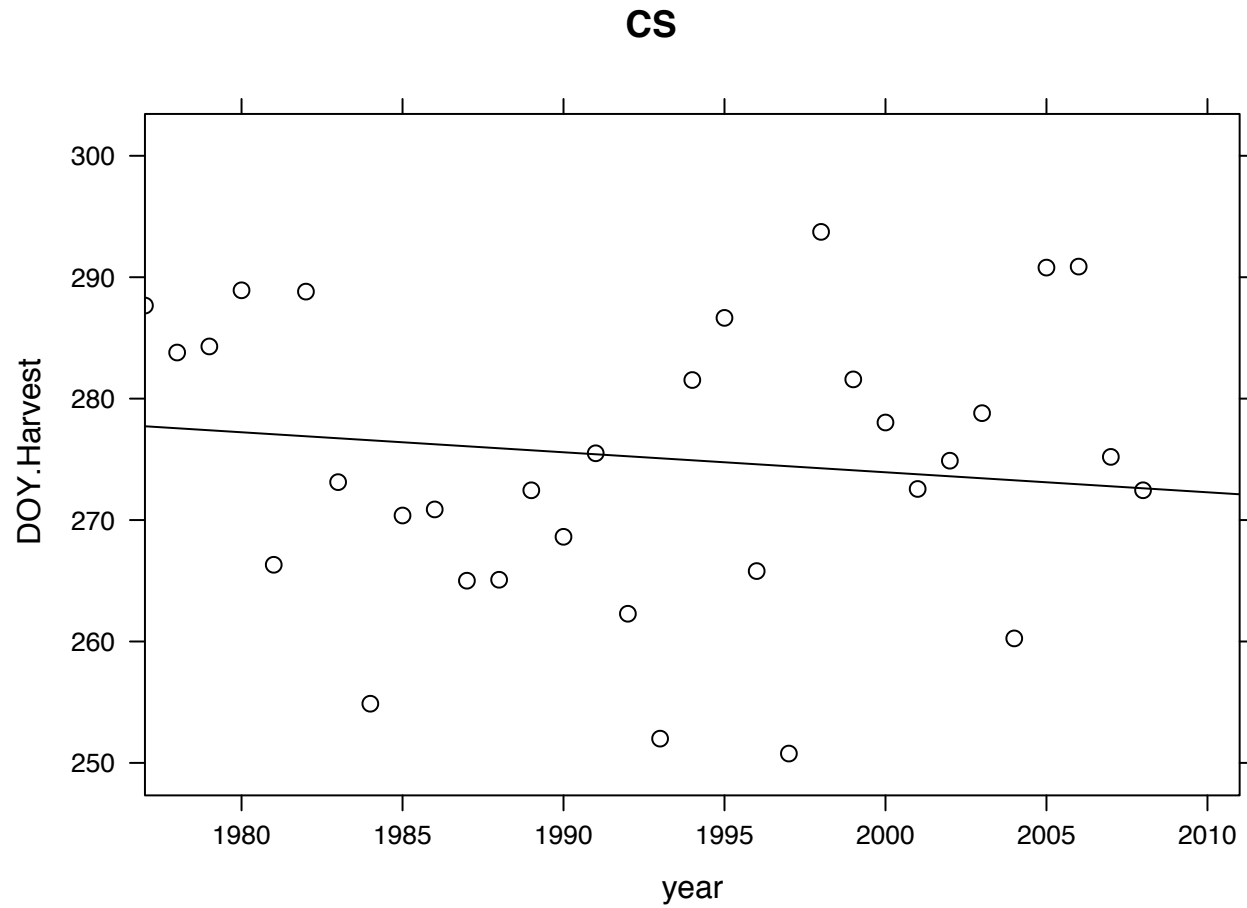


Cabernet Sugar by Harvest Date

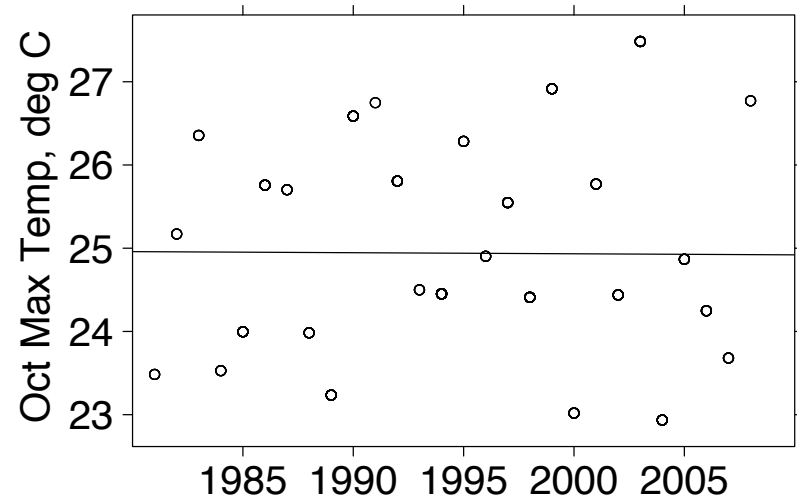
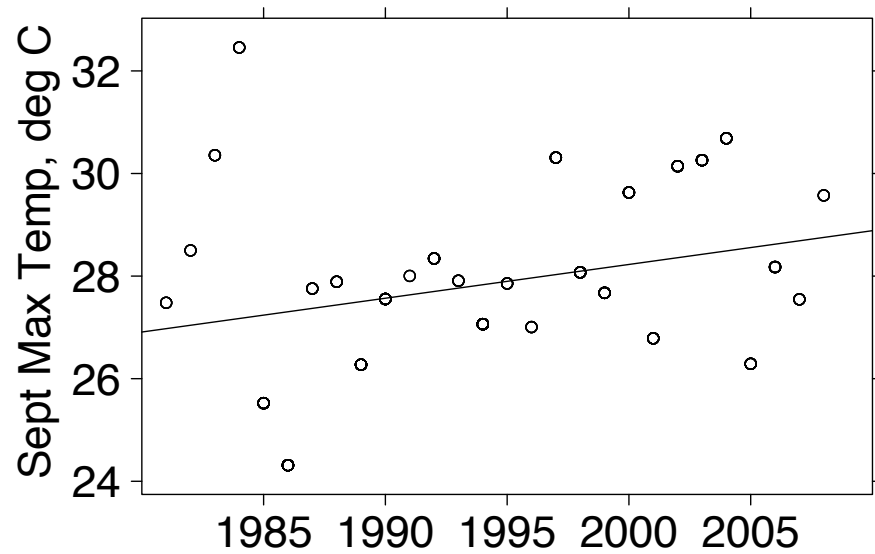
CS



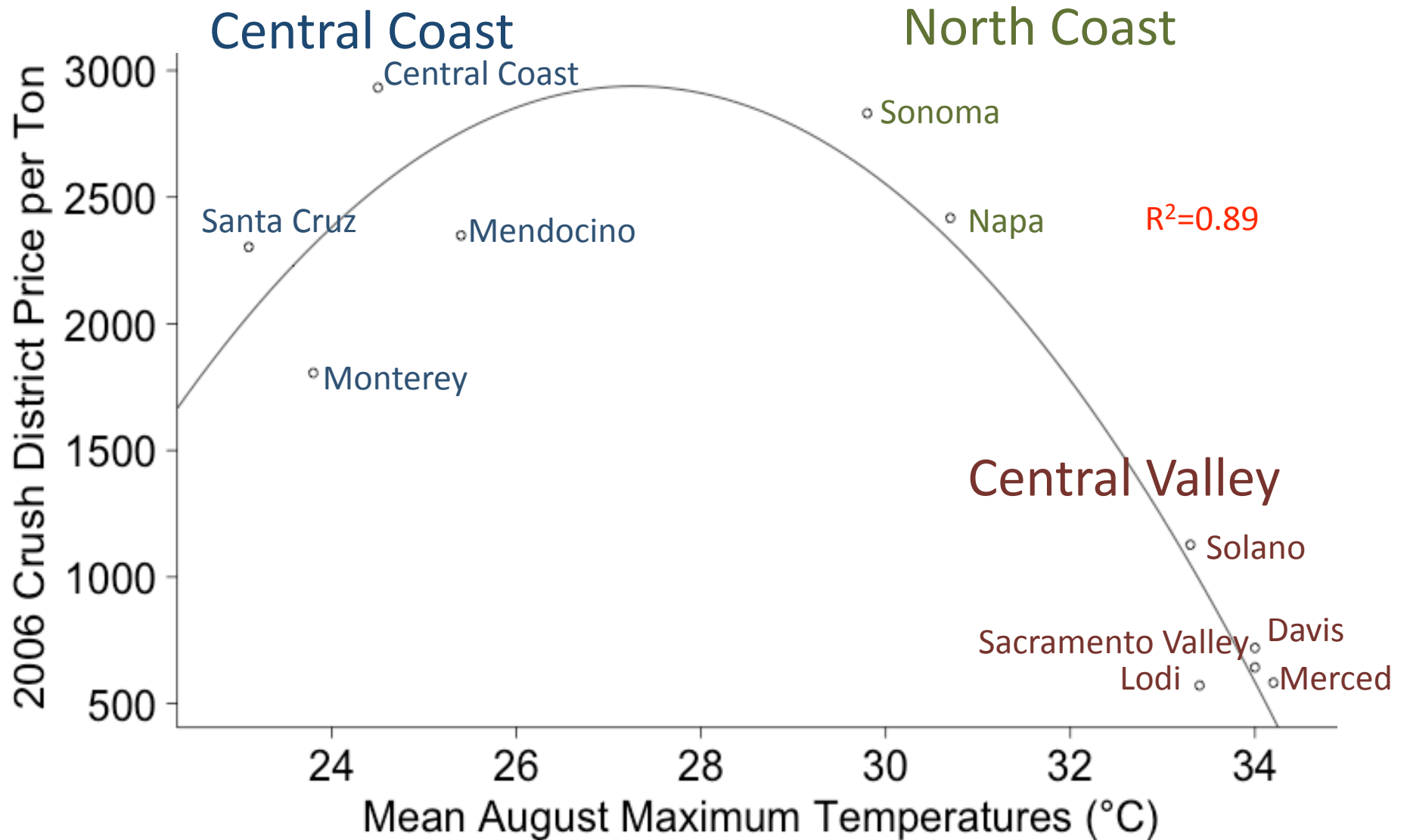
Cab Harvest Date Over Time



September warming since 1980

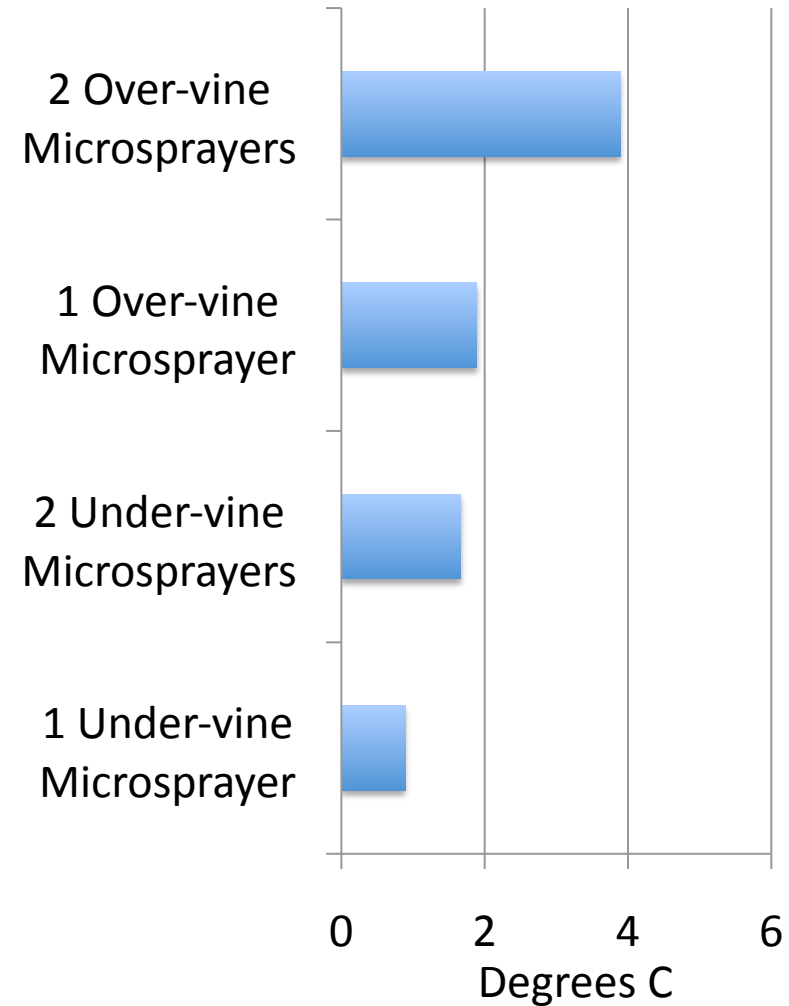
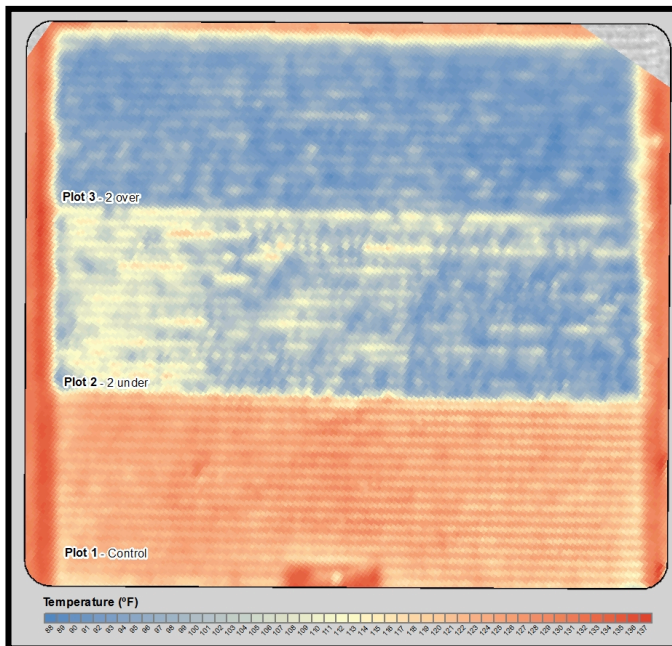


Ripening Temperature and Pinot noir Price in California



Adaptation in Action: Vineyard Cooling Trial

Cooling Achieved vs. Control Plot



Courtesy of Walsh Vineyards Management

Thanks!

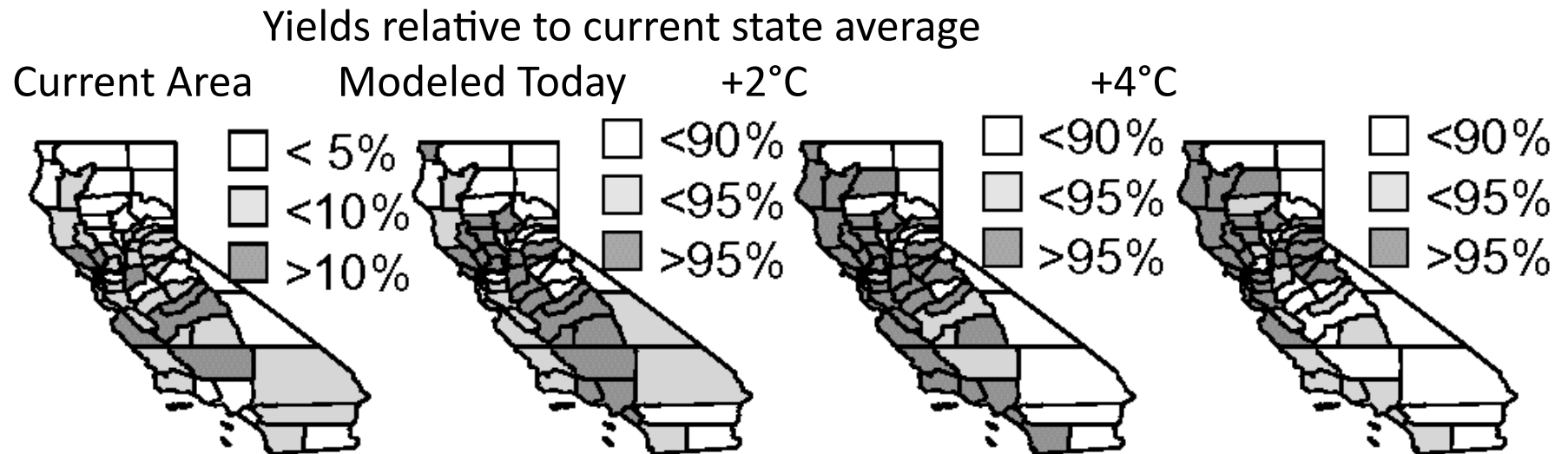
Thanks to:

- Participating vintners & growers for data contributions
- Mary Tyree for data processing and entry
- Jennifer Johns, Emelia Bainto, Kevin Thai, and Wendy Muraoka for data entry
- Napa Valley Vinters for project support
- Towle Merritt at Walsh Vineyards Management and Mark Greenspan for vineyard cooling data

Contact info: kncahill@ucdavis.edu, (415) 279-2379

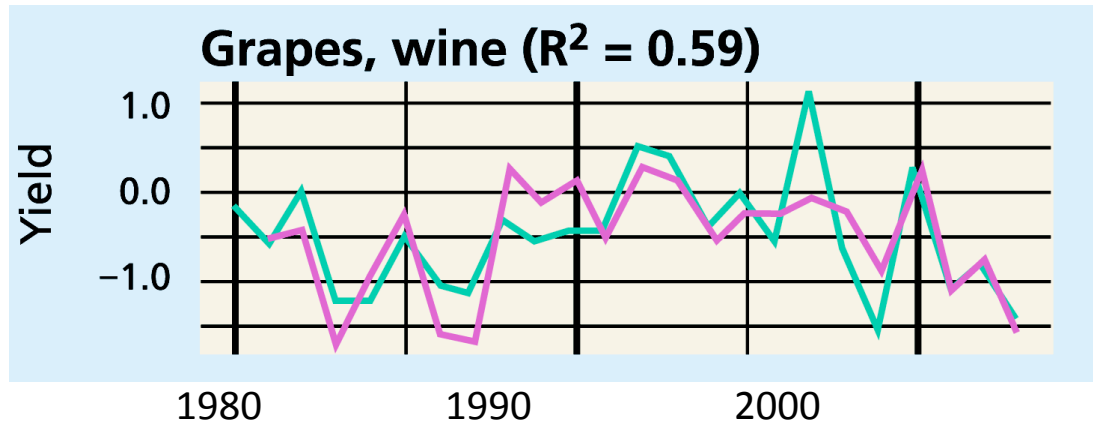


Projecting future winegrowing areas



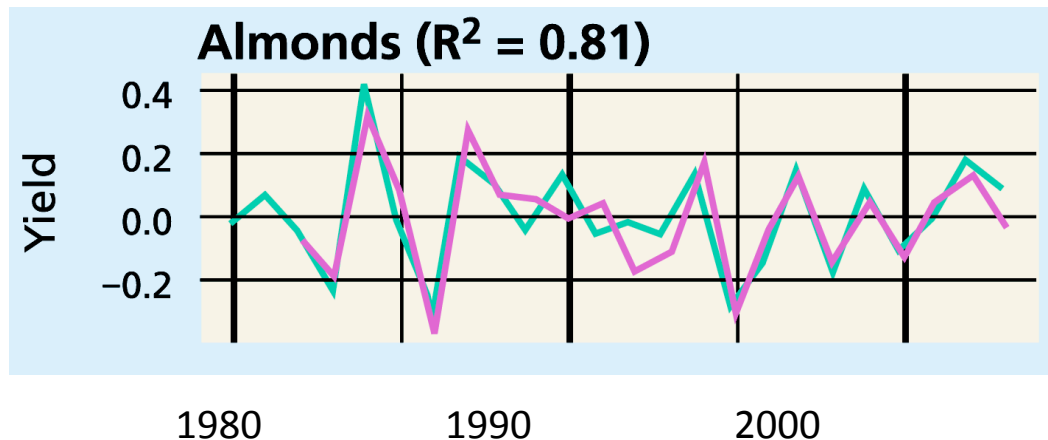
Favorable Counties	25	38	26
Overlap	81%	77%	33%

“Forecasting” within-season yields



Increased
lead time Forecast
right
direction

1-2 months 61%



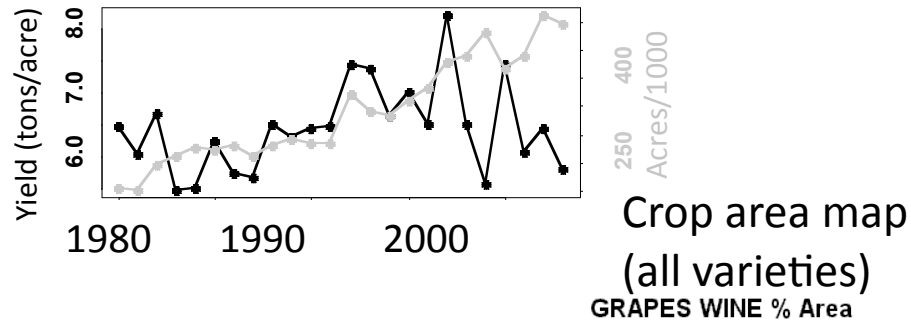
4 months 73%

— Forecast yields
— Observed yields

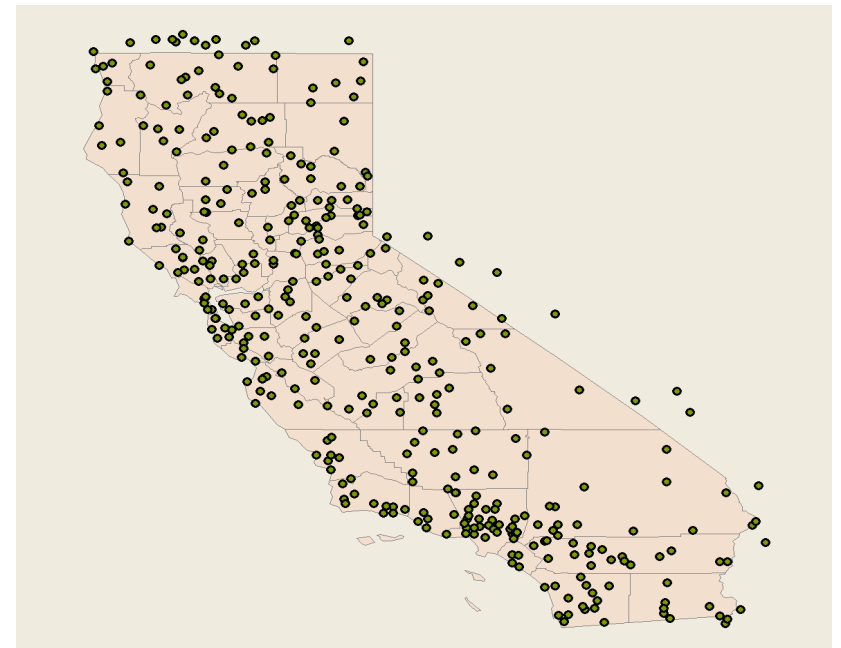
Modeling Historical Climate & Yields

(for 12 crops)

State time series, 1980-2003

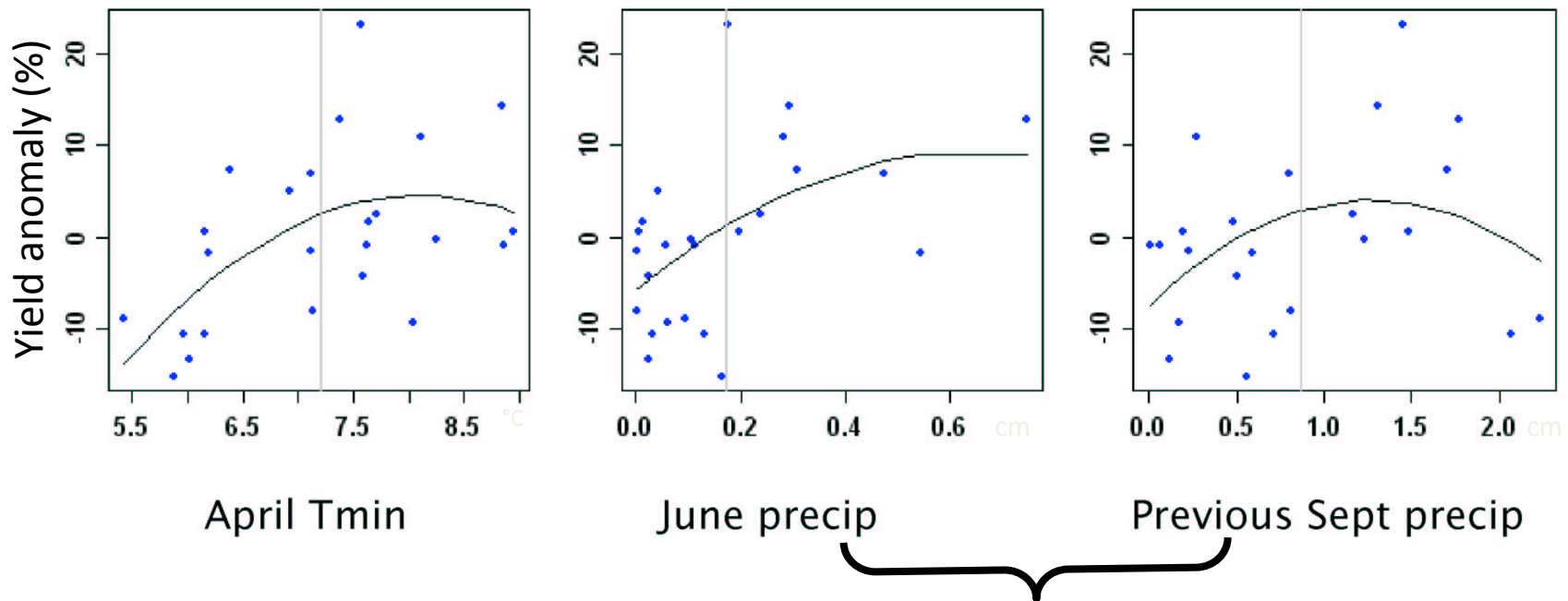


+ Daily weather data from 382 stations
(Tmin, Tmax, precip)



Lobell, Cahill, and Field, 2007, *Climatic Change*

Key Drivers of Wine Grape Yields



Surprising for irrigated crop in Mediterranean climate!

- High wine grape yields favored by:
- warm April, wet June, wet Sept before harvest ($R^2=0.62$)